

REMARKS

Claims 27-32 have been added. Claims 1-32 are pending in the application. In view of the foregoing amendments, and the remarks that follow, reconsideration is respectfully requested.

Allowable Subject Matter

Noted with appreciation is the indication in the Office Action that Claims 15-26 are allowed.

Also noted with appreciation is the indication that Claims 3-5, 10-12 and 14 recite allowable subject matter, and would be allowed if rewritten in independent form. Claims 3-5, 10-12 and 14 depend from independent Claim 1, and Claim 1 is believed to be allowable for reasons discussed below. It is therefore believed to be unnecessary to separately place Claims 3-5, 10-12 and 14 in independent form at this time.

Independent Claim 1

The Office Action rejects independent Claim 1 under 35 U.S.C. §102, asserting that Claim 1 is anticipated by Vahedi et al. (US 2003/0148224). This ground of rejection is respectively traversed, for the following reasons. The PTO specifies in MPEP §2131 that, to anticipate a claim, a reference must teach each and every element recited in the claim. In the present application, Claim 1 includes a recitation of:

introducing a second gas containing oxygen for polymer formation control; and

partial etching the ARC layer defined by the at least one opening and subsequently forming a polymer layer on the inside of the at least one opening.

To support the rejection of this language from Claim 1, the Vahedi reference must disclose each and every element recited in this language. It is respectfully submitted that Vahedi fails to do so.

First, the Examiner asserts that Vahedi teaches "introducing a second gas containing oxygen for polymer formation control". The Examiner refers to paragraph 76 of Vahedi to support this assertion. This assertion is respectively traversed. What Vahedi actually teaches in paragraph 76 is that the purpose of the oxygen is that the excited plasma environment "splits oxygen or nitrogen molecules into etchant ions". This is more clearly explained in paragraph 69, where Vahedi states that:

After or during the process of forming polymer film 24, a plasma etch is performed to reduce the critical dimensions of photoresist lines 18a-d. Photoresist lines 18a-d are exposed to an etchant flow 20/20', using a low RF bias power. Etchant flow 20/20' is created by introducing oxygen or nitrogen gas into a plasma environment.
(Emphasis added)

Clearly, Vahedi does not use oxygen for polymer formation control. Instead, oxygen is used for the purpose of photoresist etching.

Second, the Examiner asserts that the Vahedi reference teaches:

etching the ARC layer and the insulation layer in a process comprising: ...partial etching the ARC layer defined by the at least one opening and subsequently forming a polymer layer on the inside of the at least one opening.

The Examiner refers to paragraph 76 of the Vahedi reference to support this assertion. This assertion is respectively traversed. Vahedi discusses photoresist “trimming”, which is photoresist etching. For example, as explained by Vahedi in paragraph 11:

plasma etching has been considered as a method for further reducing the critical dimension CD1, which defines feature sizes of photoresist lines 18a-d. This technique is called photoresist trimming. (Emphasis added).

Vahedi further explains in paragraph 76 that:

Although, the deposition of a polymer film and the process of photoresist trimming have been illustrated separately in FIGS. 3A and 3B, in a preferred embodiment of the present invention, they occur concurrently. (Emphasis added)

Thus, Vahedi teaches a process that includes etching (trimming) a photoresist layer and forming a polymer layer, rather than etching an ARC layer and forming a polymer layer. In Vahedi, the ARC layer (as a portion of an intermediate layer) is etched after trimming the photoresist layer. As described in paragraph 80:

...intermediate etchant 32 has etched away large portions of intermediate layers 15, leaving intermediate layers lines 15a-d. As shown, the pattern of trimmed photoresist lines 18a-d has been transferred, forming intermediate layers lines 15a-d. (Emphasis added)

Vahedi further explains in paragraph 69 that forming of the polymer layer occurs no later than the photoresist trimming:

After or during the process of forming polymer film 24, a plasma etch is performed to reduce the critical dimensions of photoresist lines 18a-d. (Emphasis added)

Thus Vahedi teaches that photoresist trimming occurs after or during the process of forming a polymer, and that etching of an ARC layer occurs after the photoresist trimming. In other words, polymer formation occurs before etching of the ARC layer. This is more clearly illustrated by the flowchart in Figure 5 of Vahedi, which includes step 44 to “[f]orm polymer film”, step 46 to “[r]emove polymer film and portions of photoresist lines” and step 48 to “[e]tch the intermediate layer” (which includes the ARC). Thus, and contrary to the assertion in the Office Action, Vahedi fails to teach Applicants’ claim limitation of “partial etching the ARC layer defined by the at least one opening and subsequently forming a polymer layer”. (Emphasis added)

As noted above, MPEP §2131 requires that, for a reference to anticipate a claim under §102, the reference must teach each and every element recited in the claim. Since Vahedi does not disclose each and every element recited in Claim 1, Vahedi does not anticipate Claim 1 under §102. Claim 1 is therefore believed to be allowable over Vahedi, and notice to that effect is respectfully solicited.

Independent Claim 27

New independent Claim 27 includes a recitation of “protecting the photoresist layer from etching”. This is not taught by Vahedi. Instead, Vahedi teaches the opposite, in that the central focus of Vahedi is etching or “trimming” of a photoresist, rather than protecting that photoresist from etching.

Dependent Claims

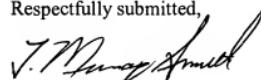
Claims 2, 6-9 and 13 depend from Claim 1, and are also believed to be distinct from the art of record, for example for the same reasons discussed above with respect to Claim 1.

Claims 28-32 depend from Claim 27, and are also believed to be distinct from the art of record, for example for the same reasons discussed above with respect to Claim 27.

Conclusion

Based on the foregoing, it is respectfully submitted that all of the pending claims are fully allowable, and favorable reconsideration of this application is therefore respectfully requested. If the Examiner believes that examination of the present application may be advanced in any way by a telephone conference, the Examiner is invited to telephone the undersigned attorney at 972-739-8647.

Respectfully submitted,



T. Murray Smith
Registration No. 30,222
(972) 739-8647

Date: August 5, 2005

HAYNES AND BOONE, LLP
901 Main Street, Suite 3100
Dallas, Texas 75202-3789
Telephone: (972) 739-6900
Facsimile: (214) 200-0853
File: 24061.144

Enclosures: Amendment Transmittal
Check (\$300.00)
Acknowledgment Post Card

R-110781.1